10-1971

D.O. and other tests

Walter A. Lawrance
Bates College

TWENTY-NINTH ANNUAL REPORT

PART TWO

ANDROSCOGGIN RIVER
DISSOLVED OXYGEN AND OTHER TESTS

1971

Introduction. Part two contains the results and comparisons of analytical and test data. Emphasis is given to the statistics of the dissolved oxygen content of the river water, including the natural aeration at Riley and other Dams. Mechanical aeration at Gulf Island Dam is described in Part Three. Biochemical Oxygen Demand data are contained in Parts One and Three. Data from all sampling stations from Berlin to Turner Center have been calculated and averaged by a computor on a daily and weekly basis.

Included in this Part Two of the report: (1) a special account of certain environmental effects of escessive changes in the pH of Androscoggin River water, and (2) the results obtained and observations made during a Special Study on Foam, Surface Tension and Conductivity.

DISSOLVED OXYGEN

River flows were lower and water temperatures were higher than normal during most of the testing period. Aeration in the Riley-Livermore Falls sector was large and very beneficial, without it conditions in the Pool and Lewiston would have been disastrous.

1. Bell's (Berlin). The quality of the river water passing this station seldom varies from year to year. This season the dissolved oxygen exceeded 80% saturation in most of the thirty-seven tests, however, the amount available was much less than in 1969 and 1968 but was the same as in 1970.

1971	90590	lbs.	per	day	1967	82400	lbs.	per day
1970	90000	"	"	"	1966	88900	"	" "
1969	112700	"	"	"	1965	70200	"	" "
1968	104000	"	"	"				

The variations reflect the conditions of flow and temperature.

Late in the testing season a small but important pollutant was contaminating the water at "Bell's". A new location may be necessary to obtain representative samples.

2. Gorham, N.H. From June one to September eleven, dissolved oxygen analyses were recorded 6.0 ppm or higher on eighteen days, but there were fifteen days when the tests were below 5.0 ppm; the seasons low was 3.35 ppm on July one. From June one to September eleven, the dissolved oxygen usually was insufficient to meet the five day biochemical oxygen demands. The average daily loads of available dissolved oxygen were smaller than those of 1970 to 1966 but somewhat better than 1965.

1971	64600	lbs.	per	day	1967	66600	lbs.	per day
1970	67200	"	"	"	1966	82700	"	" "
1969	103300	"	"	"	1965	57600	"	" "
1968	95800	"	"	"				

DISSOLVED OXYGEN - BIOCHEMICAL OXYGEN DEMAND

Berlin, N.H. (Bell's)

Weekly Averages

1971

Week Ending	Temp.	pH	Dissolved Oxygen ppm	Dissolved Oxygen lbs/day	B.O.D.5 ppm	B.O.D.5 lbs/day
June 5	14.7	6.4	9.1	133411	0.6	8739
12	16.4	6.6	8.8	127885	0.6	9128
19	18.0	6.3	8.4	111676	0.7	9306
26	21.7	6.6	7.8	99331	1.0	11941
average	17.7	6.5	8.5	118076	0.7	9779
July 3	21.1	6.9	8.1	82232	1.0	9667
10	20.6	6.7	8.1	79775	1.0	9732
17	19.6	6.7	8.1	82486	0.8	8095
24	19.2	6.7	8.2	76947	0.7	7102
31	21.3	6.7	7.8	76933	1.1	10799
average	20.4	6.7	8.1	79675	0.9	9079
Aug. 7	21.0	6.8	8.1	79366	1.3	12749
14	20.8	6.9	7.9	78175	1.7	16262
21	20.1	6.6	8.1	88275	0.9	9684
28	19.6	6.8	8.2	78646	1.1	10183
average	20.4	6.8	8.1	81116	1.2	12219
Sept. 4	17.4	6.8	8.7	85268	1.9	18612
11	20.4	6.7	8.2	78385	2.2	20927
average	18.9	6.7	8.5	81827	2.0	19770
Season average	19.5	6.7	8.2	90590	1.1	11530
Sept. 18	18.8	6.7	8.1	84067	0.8	8791
25	17.0	6.8	8.7	85970	0.8	7685
30	15.3	6.8	9.1	-	0.7	-

Gorham, N.H.

	Days above SIX ppm	Days below FIVE ppm
1971	18	15
1970	43	8
1969	81	0
1968	67	-

3. Gilead, Maine. The quality of the river water passing this location may be considered as substantially the same as that crossing the New Hampshire-Maine State line. This sampling station was selected by the F.W.P.C.A. for their 1969 Androscoggin river water tests and also for their 1970 and 1971 "detailed" program.

This sampling station is near, 2.6 miles, east of the New Hampshire-Maine boundary that it probably will be designated as a standard reference location.

Dissolved oxygen was recorded below the high Class C requirement (5.0 ppm) on forty-seven days during the season and was not sufficient to satisfy the B.O.D.5 load during most of the testing season.

Gilead

	Below FIVE ppm	Below FOUR ppm	Lowest ppm
1971	47 days	12 days	3.20
1970	28 "	4 "	3.60
1969	0 "	0 "	5.10
1968	27 "	4 "	3.25
1967	27 "	0 "	4.30

To maintain a Class C (five ppm D.O.) water from June 21 to September 11, the average daily pollution load arriving at Gilead probably would have to be reduced by about 20000 lbs. per day.

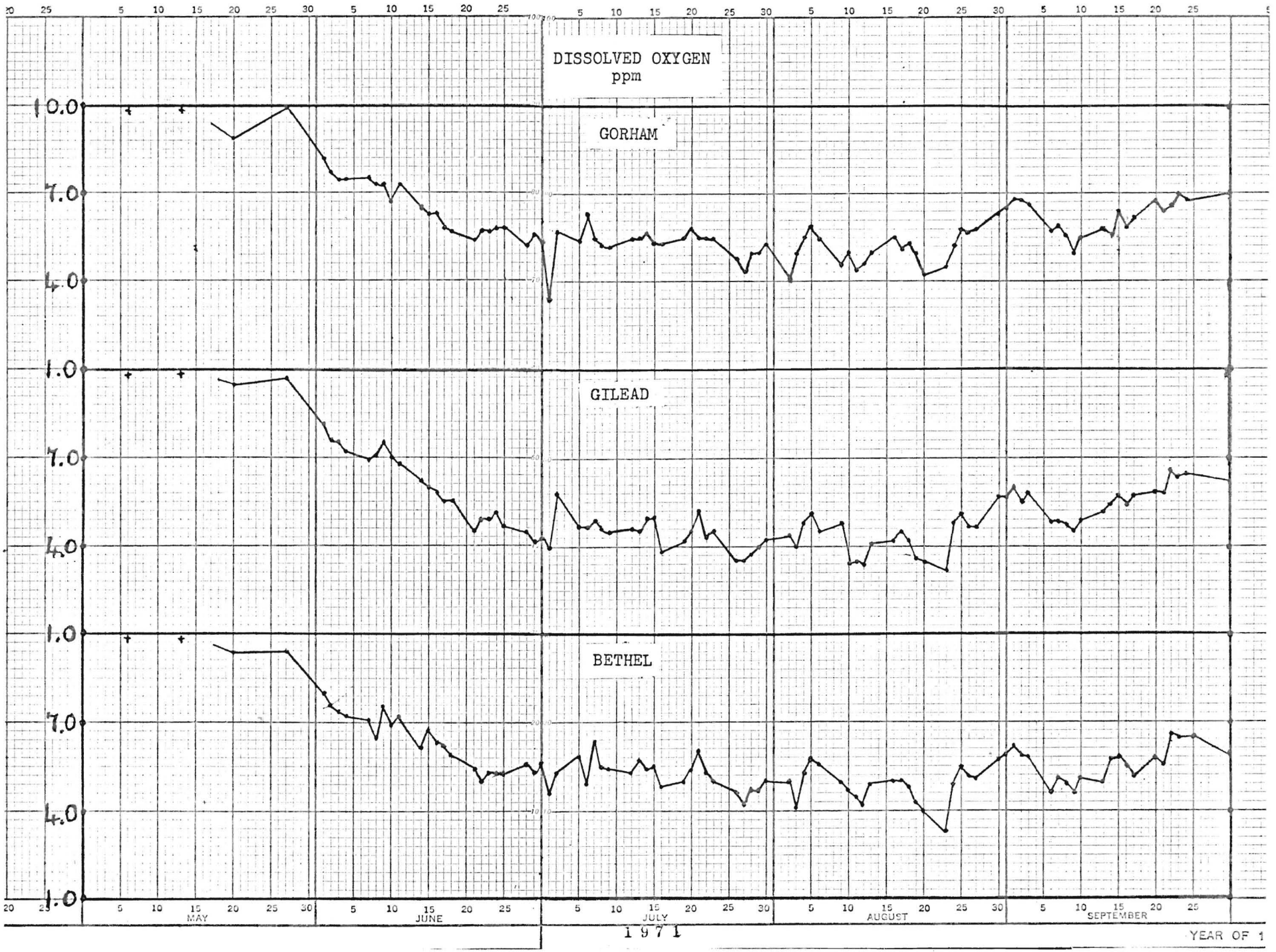
DISSOLVED OXYGEN - BIOCHEMICAL OXYGEN DEMAND

Weekly Average

Gorham, N.H.

1971

Week Ending	Temp.	pH	Dissolved Oxygen ppm	Dissolved Oxygen lbs/day	B.O.D.5 ppm	B.O.D.5 lbs/day
June 5	15.2	6.5	7.7	111663	6.6	95511
12	16.5	6.5	7.2	104344	7.2	103246
19	18.6	6.4	6.1	80990	8.8	116816
26	21.5	6.6	5.7	71022	9.2	114945
average	17.9	6.5	6.7	92003	8.0	107629
July 3	20.7	6.7	5.0	60208	11.7	134427
10	20.7	6.7	5.5	55407	8.4	84207
17	19.3	6.6	5.5	55374	11.6	118089
24	19.4	6.6	5.6	54560	10.6	103939
31	21.4	6.5	4.9	48694	11.0	110206
average	20.3	6.6	5.3	54849	10.7	110174
Aug. 7	20.8	6.5	5.2	54515	11.6	120868
14	21.3	6.4	4.7	46477	11.6	114276
21	20.5	6.6	5.0	53600	11.7	125305
28	18.6	6.7	5.4	51047	11.4	107733
average	20.3	6.5	5.1	51410	11.6	117046
Sept. 4	17.5	6.6	6.6	66655	10.2	103214
11	19.9	6.6	5.5	54433	11.4	112216
average	18.7	6.6	6.0	60544	10.8	107715
Season average	19.5	6.6	5.7	64600	10.2	111000
Sept. 18	19.0	6.6	6.0	63565	9.4	99487
25	17.1	6.6	6.7	67358	10.5	105521
30	15.8	6.5	6.8		11.0	


DISSOLVED OXYGEN
ppm
GORHAM
GILEAD
BETHEL
10.0
7.0
4.0
1.0
MAY
JUNE
JULY
AUGUST
SEPTEMBER
1971
YEAR OF 1

This reduction may also produce Class C oxygen requirements at Bethel and Virginia Bridge. Such a reduction of pollution may not have allowed a sufficient surplus of dissolved oxygen, to meet the ultimate biochemical oxygen demand.

4. Bethel. Androscoggin river water sampled at Bethel had a dissolved oxygen content above 5.0 ppm, on fifty-six test days through the analytical testing season. Comparison with last year is of interest.

Bethel

1971		1970	
1.	56 test days above 5.0 ppm	1.	70 test days above 5.0 ppm
2.	4 " " below 4.0 ppm	2.	0 " " below 4.0 ppm
3.	18 " " above 6.0 ppm	3.	38 " " above 6.0 ppm
4.	Lowest reported D.O. 3.25 ppm	4.	Lowest reported D.O. 4.5 ppm

Statistics indicate that river was in a relatively better condition at Bethel than upstream and that it should remain good to Rumford (VB), however, the dissolved oxygen content at Virginia Bridge was lower than that expected. This is similar to conditions which have been observed in previous years. Accumulation of benthal may be a factor, but the seasonal floods should flush them down stream. Small amounts of nutrients from the domestic wastes enter the river at Bethel. Nitrification is possible but not very probable. Microbial action on certain organic compounds deposited upstream may be delayed until changes have occurred in those compounds. Water temperatures are slightly higher and the slope of the river, Bethel to Virginia bridge, is less than that up stream from Bethel.

DISSOLVED OXYGEN - BIOCHEMICAL OXYGEN DEMAND

Weekly Averages

1971

Gilead

Week Ending	Temp.	pH	Dissolved Oxygen ppm	Dissolved Oxygen lbs/day	B.O.D.5 ppm	B.O.D.5 lbs/day
June 5	14.6	6.5	7.6	118939	5.1	79740
12	16.2	6.5	7.0	111330	5.1	80175
19	18.2	6.4	5.8	78328	5.2	70112
26	21.6	6.5	4.8	61534	6.4	81688
average	17.7	6.5	6.3	92533	5.5	77929
July 3	21.3	6.6	4.5	57731	7.0	85693
10	21.3	6.6	4.7	47331	4.8	48444
17	19.8	6.6	4.6	47019	6.0	61441
24	19.8	6.6	4.5	47086	6.7	69693
31	21.6	6.5	3.8	39362	6.7	70024
average	20.7	6.6	4.4	47706	6.2	67060
Aug. 7	20.7	6.6	4.6	51053	6.1	67848
14	21.6	6.5	3.8	39000	7.2	73260
21	20.8	6.6	4.0	42778	6.8	72470
28	18.2	6.7	4.4	43755	7.1	69470
average	20.4	6.6	4.2	44147	6.8	70762
Sept. 4	17.7	6.6	5.7	60859	6.1	65212
11	20.0	6.6	4.7	48109	5.9	60449
average	18.9	6.6	5.2	54480	6.0	62830
Season average	19.6	6.6	5.0	59610	6.2	70380
Sept. 18	19.0	6.6	5.7	63467	5.6	64833
25	16.9	6.6	6.2	66862	6.5	69422
30	15.9	6.6	6.9		4.9	

DISSOLVED OXYGEN - BIOCHEMICAL OXYGEN DEMAND

Weekly Average

1971

Bethel

Week Ending	Temp.	pH	Dissolved Oxygen ppm	Dissolved Oxygen lbs/day	B.O.D.5 ppm	B.O.D.5 lbs/day
June 5	15.3	6.5	7.5	121612	4.6	73600
12	16.8	6.6	7.0	114399	3.8	61524
19	18.9	6.4	6.2	84870	4.1	55727
26	21.8	6.5	5.3	67682	4.8	61419
average	18.2	6.5	6.5	97141	4.3	63063
July 3	21.3	6.6	5.3	66367	5.9	77788
10	21.5	6.6	5.6	56692	3.6	36445
17	19.8	6.6	5.3	55021	4.5	46553
24	19.9	6.6	5.3	56542	4.4	46042
31	21.5	6.6	4.6	49166	3.8	40481
average	20.8	6.6	5.2	56757	4.4	49462
Aug. 7	20.9	6.5	5.2	59188	4.3	49462
14	21.6	6.5	4.7	47906	5.1	52516
21	20.8	6.6	4.6	49495	4.0	43284
28	18.0	6.7	4.8	47174	4.5	44802
average	20.4	6.6	4.8	50941	4.5	47516
Sept. 4	17.5	6.6	5.9	63648	4.0	42931
11	19.8	6.6	4.9	49980	3.6	37161
average	18.7	6.6	5.4	56810	3.8	40050
Season average	19.7	6.6	5.5	65980	4.3	51320
Sept. 18	19.0	6.6	5.4	65177	3.6	43022
25	16.9	6.7	6.2	68088	3.5	38907
30	16.1	6.6	5.9		4.9	

5. Rumford (V.B.) Water quality was lower than that recorded during the previous six years. River flows and water temperatures were approximately the same as last year (1970).

Rumford (V.B.)

1971	54	days	below	FIVE	ppm	75	days	below	SIX	ppm
1970	42	"	"	"	"	70	"	"	"	"
1969	5	"	"	"	"	40	"	"	"	"
1968	40	"	"	"	"	68	"	"	"	"
1967	25	"	"	"	"	45	"	"	"	"
1966	0	"	"	"	"	8	"	"	"	"
1965	3	"	"	"	"	21	"	"	"	"

The lowest recorded D.O. for the 1971 season is 3.2 ppm on July one; 1970 the low point was 3.3 ppm.

During the period July five to August seven, the dissolved oxygen and B.O.D.5 statistics indicate that there was an average net decreased of dissolved oxygen, between Gorham and Rumford (VB), of 4100 lbs/day and a net loss of B.O.D.5 79100 lbs/day.

July 5-August 7

1.	Gorham	aver.	D.O.	53710	lbs/day
2.	Rumford (VB)	"	D.O.	49610	"
	Loss			4100	"
3.	Gorham	aver.	B.O.D.	107460	lbs/day
4.	Rumford (VB)	"	B.O.D.	28360	"
	Loss			79100	"

The measured average decrease of dissolved oxygen in the Gorham to Rumford (VB) stretch, 42.6 miles, is 4100 lbs/day and is accompanied by a decrease in B.O.D.5 of about 79100 lbs/day.

The apparent aeration is about 1760 lbs/mile/day; much less than in 1970. Interpretation of these calculations is complicated

DISSOLVED OXYGEN - BIOCHEMICAL OXYGEN DEMAND

Weekly Average

1971

Rumford (V.B.)

Week Ending	Temp.	pH	Dissolved Oxygen		B.O.D.5	
			ppm	lbs/day	ppm	lbs/day
June 5	15.4	6.5	7.3	135237	3.6	66509
12	17.3	6.6	6.5	122504	2.6	48853
19	19.1	6.5	5.9	83000	2.4	33765
26	22.1	6.5	4.6	61186	2.9	38343
average	18.5	6.5	6.1	100482	2.9	46868
July 3	21.9	6.5	4.1	55333	2.9	39660
10	22.3	6.6	4.5	46658	2.3	23558
17	21.2	6.6	4.5	47572	2.6	27315
24	20.9	6.7	4.6	54230	2.7	31746
31	22.5	6.6	4.0	46055	2.5	28633
average	21.7	6.6	4.3	49970	2.6	30182
Aug. 7	21.8	6.5	4.1	53547	2.3	30549
14	23.0	6.7	3.8	41780	2.0	22360
21	21.7	6.6	3.8	41535	2.2	23460
28	19.3	6.6	4.4	46315	2.3	23989
average	21.5	6.6	4.0	45794	2.2	25090
Sept. 4	17.9	6.6	5.6	66042	2.2	25604
11	20.7	6.5	4.3	47078	1.9	20878
average	19.3	6.6	4.5	56560	2.1	23240
Season average	20.5	6.6	4.8	63210	2.5	32350
Sept. 18	19.0	6.6	5.2	72809	2.0	28069
25	16.7	6.6	5.7	70269	1.9	23639

by several unknowns, such as B.O.D. settling especially in the Gorham-Gilead sector, diffusion from the Benthal, photosynthesis etc., etc. For these and other reasons no attempt has been made to calculate K_2. The apparent aeration for the Gilead-Rumford (VB) sector (31.6 miles) is about 1215 lbs/mil/day; a probable figure.

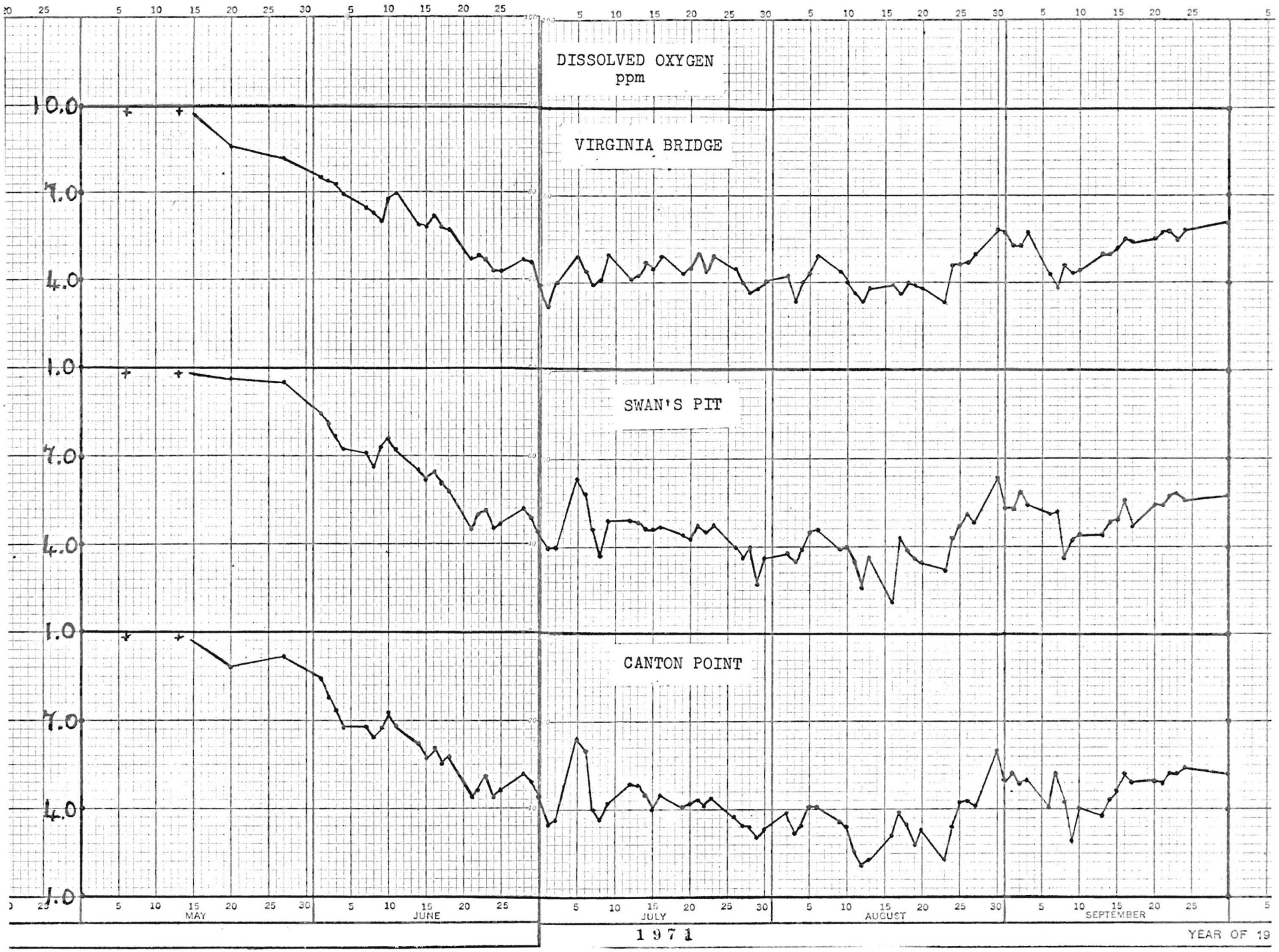
Through the entire season there was a large surplus of dissolved oxygen passing Virginia Bridge (average 30860 lbs/day) in excess of the five day biochemical oxygen demands.

6. Dixfield (Swan's Pit) This sampling station was reactivated in 1971 and the Dixfield Bridge location was abandoned. Water passing this place is considered uniform and representative of the pollution load.

From July five to August seven the daily average dissolved oxygen was 51320 lbs (4.4 ppm); the accompanying B.O.D.5 load was 75260 lbs. (6.4 ppm). The seasons recorded dissolved oxygen low is 2.1 ppm (August sixteen); the highest B.O.D.5 is 14.5 ppm, reported on the same day. As stated in Part One of this report, Dixfield (Swan's Pit) appears to be a satisfactory location to obtain representative samples of river water.

The effects of the August mechanical problems, (Rumford) which resulted in massive losses of alkline liquor, are reflected in the analytical data here and downstream.

7. Canton Point. At this station, during eleven of the season's fifteen week period, Androscoggin river water had less dissolved oxygen than the five day biochemical


DISSOLVED OXYGEN
ppm
VIRGINIA BRIDGE
SWAN'S PIT
CANTON POINT
10.0
7.0
4.0
1.0
MAY
JUNE
JULY
AUGUST
SEPTEMBER
1971
YEAR OF 19

DISSOLVED OXYGEN - BIOCHEMICAL OXYGEN DEMAND

Weekly Average

1971

Dixfield (S.P.)

Week Ending	Temp.	pH	Dissolved Oxygen ppm	Dissolved Oxygen lbs/day	B.O.D.5 ppm	B.O.D.5 lbs/day
June 5	15.6	6.8	7.8	160131	6.8	138886
12	16.8	6.7	7.2	146569	4.5	91685
19	18.3	6.7	6.2	92121	4.7	69127
26	21.2	6.7	4.8	66666	7.1	99413
average	18.0	6.7	6.5	116372	5.8	99778
July 3	20.6	6.9	4.5	60140	7.0	94441
10	20.5	6.7	5.1	55188	5.0	53777
17	20.2	6.7	4.7	50350	6.6	70939
24	19.5	6.8	4.5	53479	7.0	83705
31	21.5	6.8	3.6	42210	6.5	76347
average	20.5	6.8	4.5	52273	6.4	75842
Aug. 7	21.3	6.7	4.1	55360	6.8	91544
14	21.6	7.1	3.5	38399	7.0	76196
21	20.4	6.9	3.5	36751	9.6	100082
28	18.2	6.7	4.4	45725	6.8	70159
average	20.4	6.9	3.9	44059	7.6	84495
Sept. 4	16.5	6.9	5.6	70905	7.5	92753
11	19.7	6.7	4.5	49498	5.0	55486
average	18.1	6.8	5.1	60200	6.3	74120
Season average	19.5	6.8	4.9	68230	6.5	84300
Sept. 18	18.7	6.9	4.9	69982	6.4	90552
25	16.0	6.8	5.6	67789	7.2	87021

DISSOLVED OXYGEN - BIOCHEMICAL OXYGEN DEMAND

Weekly Average

1971

Canton Point Bridge

Week Ending	Temp.	pH	Dissolved Oxygen ppm	Dissolved Oxygen lbs/day	B.O.D.5 ppm	B.O.D.5 lbs/day
June 5	14.8	6.8	7.6	162089	4.7	100609
12	17.0	6.7	6.8	144221	4.5	95895
19	18.4	6.7	5.8	88856	5.5	84338
26	21.7	6.7	4.6	65658	6.3	88700
average	18.0	6.7	6.2	115206	5.3	92386
July 3	21.6	6.8	4.0	53948	6.5	87836
10	21.7	6.8	4.9	54244	4.7	51803
17	20.9	6.8	4.3	45923	6.1	65309
24	20.5	6.9	4.2	50125	6.0	72234
31	22.2	6.7	3.3	39611	5.5	65075
average	21.4	6.8	4.2	48770	5.8	68451
Aug. 7	21.6	6.7	3.8	52336	6.1	85237
14	22.6	7.1	2.8	30515	5.8	63624
21	21.6	6.9	3.3	34431	5.9	61182
28	19.4	6.7	3.7	37755	5.7	58944
average	21.3	6.9	3.4	38759	5.9	67247
Sept. 4	17.4	6.9	5.2	67969	6.2	80296
11	20.5	6.8	4.1	45023	4.1	45208
average	19.0	6.9	4.7	56500	5.2	62750
Season average	20.1	6.8	4.6	64850	5.6	73750
Sept. 18	18.9	6.8	4.6	66276	5.7	81847
25	16.6	7.0	5.1	61766	6.1	73711

oxygen demand. In a comparable period last year (1970), four weeks were recorded in the deficit column. The lowest dissolved oxygen was recorded as 2.1 ppm on August twelve. Forty-three days were below 5.0 ppm (eight, 1969) and twenty-three days were reported below 4.0 ppm (none, 1969).

During this season the daily average dissolved oxygen was 4.6 ppm equivalent to 64850 lbs. At Dixfield (SP) the corresponding figures are 4.9 ppm and 68230 lbs., indicating a daily measured loss of 0.3 ppm and 3380 lbs. In the same stretch of the river, the measured loss of B.O.D.5 was 10550 lbs/day. Excluding settling etc. these figures indicate an aeration of about 7170 lbs. per day, approximating 1050 lbs/mile/day.

To obtain a Class C (five ppm D.O.) condition in the river at Canton Point during the month of August, may have required a daily reduction of about 15000 pounds of B.O.D.5 arriving at this station.

8. Riley Dam. From June one to September twelve, fifty-eight days were recorded below Five ppm D.O. (54 days, 1970) and thirty-seven days were below Four ppm. The August high was 5.5 ppm, August 30; the season's low was 1.8 ppm on August 18 and 19.

Aeration at Riley Dam. Study of aeration at Riley Dam covered fifteen weeks, June one to September eleven. From June one to July twenty-four, the dissolved oxygen in the river water arriving at the dam averaged 5.1 ppm, but from

July twenty-seven to September eighteen the average was only 3.2 ppm. Although the two periods were quite different in oxygen content, flow, and temperature, the dissolved oxygen arriving at the pump house was recorded as averaging about 6.2 ppm through the fifteen weeks. The daily increase of dissolved oxygen for the entire season averaged about 26190 lbs. These statistics are very similar to those obtained for the 1970 aeration study.

AERATION AT RILEY DAM 1971

	D.O. lbs/day	ppm average
June 1 to July 24 (8 weeks)		
Pump House	104890	6.9
Riley Dam	80910	5.1
D.O. gain (aver.)	23980	1.8
Percent gain	22.9%	
July 26 to September 11 (7 weeks)		
Pump House	66670	5.7
Riley Dam	37970	3.2
D.O. gain (aver.)	28700	2.5
Percent gain	43.0%	
June 1 to September 11 (15 weeks)		
Pump House*	87060	6.2
Riley Dam *	60870	4.2
D.O. gain (aver.)	26190	2.0
Percent gain	30.0%	

*Average daily flow for the season 2486 cfs

Period	Pump House				Aeration Increase	
	Pump H. D.O. lbs/d	ppm	Riley D.O. lbs/d	ppm	lbs/d	ppm
June 1-June 26	133640	7.2	111980	5.9	21660	1.3
June 28-July 31	74280	6.0	48350	4.1	25930	1.9
Aug. 2-Aug. 28	61430	5.3	30870	2.7	30560	2.6
Aug. 30-Sept.11	77110	6.3	49970	4.1	27140	2.2
Season average	87060	6.2	60870	4.2	26190	2.0

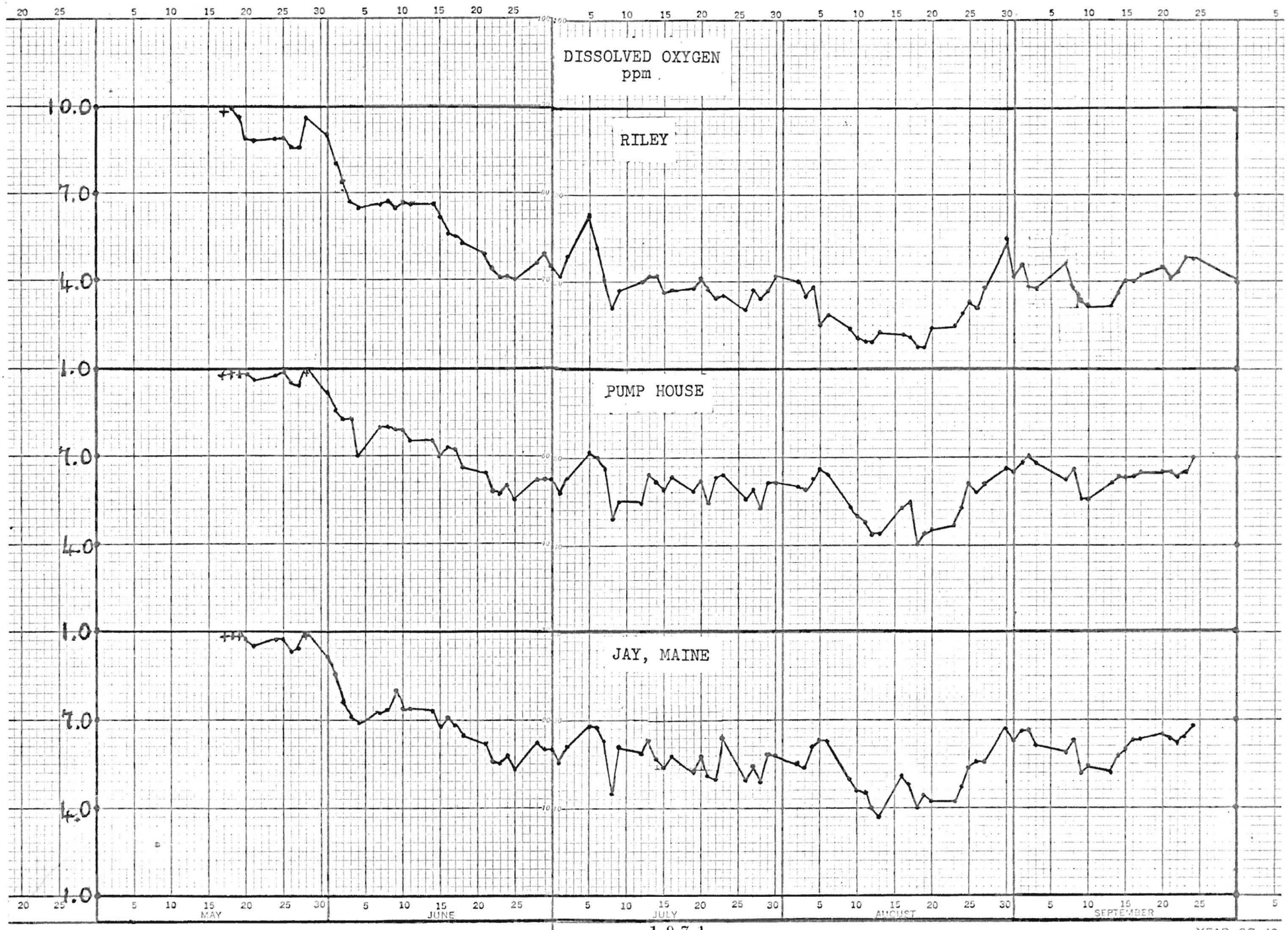
DISSOLVED OXYGEN - BIOCHEMICAL OXYGEN DEMAND

Weekly Average

1971

Riley

Week Ending	Temp.	pH	Dissolved Oxygen ppm	Dissolved Oxygen lbs/day	B.O.D.5 ppm	B.O.D.5 lbs/day
June 5	16.3	6.7	7.1	154822	2.8	60878
12	18.4	6.5	6.6	141551	2.3	48394
19	19.3	6.5	5.8	90107	2.6	40764
26	22.9	6.7	4.3	61420	4.9	70195
average	19.2	6.6	5.9	111975	3.2	55058
July 3	22.5	6.8	4.6	62614	9.1	122820
10	22.6	6.9	4.5	50445	4.4	48639
17	21.6	6.7	3.9	42246	5.1	34736
24	21.5	6.8	3.7	44096	5.4	65453
31	22.9	6.7	3.6	42356	4.1	48650
average	22.2	6.8	4.1	48351	5.6	64060
Aug. 7	22.5	6.7	3.3	46497	2.7	38891
14	23.0	6.6	2.2	23518	3.7	39884
21	22.0	6.7	2.1	21318	4.4	45477
28	20.3	6.5	3.1	32145	3.6	36552
average	22.0	6.6	2.7	30870	3.6	40201
Sept. 4	18.3	6.7	4.4	58157	4.8	60823
11	20.6	6.5	3.7	41789	4.3	48148
average	19.5	6.6	4.1	49970	4.6	54490
Season average	21.0	6.7	4.2	60870	4.3	54020
Sept. 18	19.4	6.7	3.8	55153	4.3	61398
25	17.4	6.6	4.5	53832	3.4	39989


DISSOLVED OXYGEN
ppm
RILEY
PUMP HOUSE
JAY, MAINE
10.0
7.0
4.0
1.0
MAY
JUNE
JULY
AUGUST
SEPTEMBER
1971
YEAR OF 19

9. Pump House. With the exception of biochemical oxygen demands, all the usual tests were made on river water entering the Pump House, located about 0.6 miles downstream from the Riley Dam. Daily data are recorded on the adjacent pages.

DISSOLVED OXYGEN

Aeration at Riley Dam 1971

Week Ending	Pump House ppm	Pump House av.lbs/day	Riley Dam ppm	Riley Dam av.lbs/day	Riley — P.House D.O.gain lbs/day
June 5	8.1	173608	7.1	154822	18786
12	7.9	167731	6.6	141551	26180
19	7.1	109377	5.8	90107	19270
26	5.9	83830	4.3	61420	22410
average	7.3	133637	6.0	111975	21662
July 3	6.1	98792	4.6	62614	36178
10	6.2	69692	4.5	50445	19247
17	6.0	64827	3.9	42246	22581
24	6.0	71270	3.7	44096	27174
31	5.7	66794	3.6	42356	24438
average	6.0	74275	4.1	48351	25924
Aug. 7	6.2	87604	3.3	46497	41107
14	4.8	51933	2.2	23518	28415
21	4.7	48638	2.1	21318	27320
28	5.6	57538	3.1	32145	25123
average	5.3	61428	2.7	30870	30491
Sept. 4	6.7	87065	4.4	58157	28908
11	6.0	67147	3.7	41789	25358
average	6.4	77106	4.2	49973	27133
Season average	6.2	87060	4.2	60870	26190

10. Jay, Maine. The excellent aeration at Riley Dam did not prevent the dissolved oxygen falling below five ppm on twelve days. The season's recorded low is 3.7 ppm, August thirteen.

1971	29	days	Above	SIX	ppm	12	days	Below	FIVE	ppm
1970	42	"	"	"	"	16	"	"	"	"
1969	74	"	"	"	"	2	"	"	"	"
1968	61	"	"	"	"	6	"	"	"	"
1967	47	"	"	"	"	8	"	"	"	"

Dissolved oxygen in the river water sampled at Jay was insufficient to meet the five-day biochemical oxygen demands for

6	weeks	1971 season
8	"	1970 "
1	"	1969 "

PUMP HOUSE

May, June, 1971

Date	Temp. C	pH	D.O. ppm	D.O. % Sat.	D.O. lbs/d
May					
17	9.5	6.4	10.8	95.7	
18	10.3	6.3	10.6	93.8	
19	12.2	6.3	10.2	94.6	
20	14.3	6.3	9.8	94.3	
21	14.5	6.3	9.6	94.2	
24	12.1	6.3	9.8	90.7	
25	12.2	6.4	9.9	91.7	
26	13.0	6.4	9.5	89.7	
27	12.8	6.4	9.4	88.7	
28	12.1	6.7	10.3	95.3	
31	15.4	6.7	9.2	90.2	
June 1	15.3	6.8	8.6	84.3	202891
2	16.7	6.7	8.3	85.6	179488
3	17.0	6.7	8.3	85.6	169735
4	17.3	6.7	7.0	72.3	142317
Wk Aver	16.6	6.7	8.1		173608
7	17.8	6.4	8.0	84.3	147224
8	19.2	6.6	8.0	85.2	167480
9	18.7	6.5	7.9	84.3	197484
10	18.2	6.5	7.9	83.3	180207
11	18.3	6.5	7.5	78.8	146258
Wk Aver	18.2	6.5	7.9		167731
14	18.5	6.5	7.5	79.8	120675
15	18.7	6.5	7.0	74.4	112294
16	20.0	6.4	7.3	79.3	113208
17	19.6	6.5	7.2	78.3	106776
18	20.5	6.4	6.6	73.3	93931
Wk Aver	19.5	6.5	7.1		109377
21	23.4	6.5	6.4	73.7	89152
22	23.2	6.6	5.8	66.7	84141
23	23.2	6.7	5.7	65.6	84742
24	22.1	6.8	6.0	68.2	86460
25	22.7	6.7	5.5	63.3	74657
Wk Aver	22.9	6.7	5.9		83830
28	21.5	6.6	6.2	70.5	77847
29	22.4	6.6	6.2	70.5	70661
30	22.1	6.9	6.2	70.5	77010
Monthly Average - June 1 to 25 inclusive					
	19.3	6.6	7.2		113637

PUMP HOUSE

July, 1971

Date	Temp.	pH	D.O. ppm	D.O. % Sat.	D.O. lbs/d
1	23.1	6.8	5.8	66.7	68695
2	23.4	6.8	6.3	72.4	119744
Wk Aver	22.5	6.7	6.1		98792
5	21.3	7.2	7.2	80.0	86832
6	22.8	7.0	7.0	79.6	77070
7	23.1	6.5	6.6	74.3	69920
8	23.2	6.9	4.9	56.3	52866
9	23.4	7.0	5.5	63.3	61771
Wk Aver	22.8	6.9	6.2		69692
12	22.2	6.7	5.4	61.4	53860
13	21.6	6.7	6.4	72.7	66739
14	21.5	6.6	6.2	70.5	66855
15	21.5	6.6	5.9	67.2	65525
16	21.7	6.9	6.3	71.6	71159
Wk Aver	21.7	6.7	6.0		64827
19	22.6	7.0	5.8	66.7	66886
20	21.3	6.7	6.2	68.9	75435
21	21.4	6.6	5.4	60.0	70627
22	21.2	6.9	6.3	70.2	75947
23	21.2	6.9	6.4	71.4	67456
Wk Aver	21.5	6.8	6.0		71270
26	23.2	6.9	5.0	57.4	66335
27	23.3	6.7	5.9	67.8	70611
28	22.6	6.6	5.3	60.8	61687
29	22.8	6.7	6.1	70.2	67454
30	23.4	6.8	6.1	70.2	67881
Wk Aver	23.1	6.7	5.7		66794
Monthly average June 28 - July 30	22.3	6.7	6.0		74275

PUMP HOUSE

August, 1971

Date	Temp.	pH	D.O. ppm	D.O. % Sat.	D.O. lbs/d
2	23.4	6.6	6.0	68.9	73000
3	23.4	6.8	5.9	67.8	83302
4	23.0	6.9	6.3	72.5	92856
5	21.4	7.0	6.6	73.3	103851
6	21.4	6.5	6.4	71.2	85011
Wk Aver	22.5	6.8	6.2		87604
9	21.8	6.6	5.3	60.3	59037
10	23.1	6.4	5.0	57.5	53460
11	24.0	6.5	4.8	56.5	52176
12	22.9	6.4	4.4	50.6	47758
13	23.1	6.9	4.4	50.6	47234
Wk Aver	23.0	6.6	4.8		51933
16	21.1	6.5	5.3	58.8	52470
17	21.4	6.7*	5.4	60.1	53460
18	22.5	7.0	4.0	46.1	40760
19	22.2	6.8	4.4	50.0	48514
20	23.3	6.6	4.5	51.7	47988
Wk Aver	22.1	6.7	4.7		48638
23	23.5	6.5	4.7	55.2	46906
24	21.3	6.5	5.3	58.8	55353
25	18.8	6.6	6.1	64.8	64361
26	19.2	6.5	5.8	61.7	57820
27	19.1	6.6	6.1	64.9	63251
Wk Aver	20.4	6.5	5.6		57538
30	18.8	6.8	6.6	70.3	113665
31	18.4	6.5	6.5	68.4	85293
Monthly Average		August 2 - August 27			
	22.0	6.7	5.3		61428

PUMP HOUSE

September, 1971

Date	TEMP.	pH	D.O. ppm	D.O. % Sat.	D.O. lbs/d
1	18.4	6.6	6.8	71.7	80097
2	17.5	6.6	7.0	73.7	77819
3	18.7	6.7	6.8	72.4	78452
average	18.4	6.6	6.7		87065
6	Holiday				
7	20.3	6.4	6.2	67.4	69428
8	20.2	6.5	6.6	71.7	78989
9	21.3	6.6	5.6	62.3	62894
10	21.0	6.6	5.6	62.2	57277
average	20.7	6.5	6.0		67147
Aug. 30-Sept.11 average	19.6	6.6	6.4		77106
Season average	21.1	6.7	6.2		87060
13	19.4	6.6	6.1	64.8	71754
14	19.3	6.7	6.3	67.2	83343
15	19.1	6.6	6.3	67.0	107717
16	19.9	6.9	6.3	68.4	101915
17	20.1	6.7	6.5	70.7	89700
average	19.6	6.7	6.3		90890
20	18.9	6.7	6.5	69.3	74048
21	17.9	6.5	6.5	68.4	75407
22	17.4	6.6	6.3	65.0	80256
23	16.5	6.5	6.5	67.1	77903
24	16.6	6.6	7.0	72.2	83699
average	17.5	6.6	6.6		78260

DISSOLVED OXYGEN - BIOCHEMICAL OXYGEN DEMAND

Weekly Average

1971

Jay

Week Ending	Temp.	pH	Dissolved Oxygen ppm	Dissolved Oxygen lbs/day	B.O.D.5 ppm	B.O.D.5 lbs/day
June 5	17.0	6.7	7.5	116211	6.1	135605
12	19.0	6.9	7.5	162368	3.6	76887
19	20.1	7.1	6.9	107236	4.2	65202
26	23.4	7.0	5.7	81747	5.9	84675
average	19.9	6.9	6.9	129391	5.0	90592
July 3	22.9	7.1	6.0	80603	10.4	136405
10	23.3	7.1	6.1	68844	4.9	54621
17	22.3	6.8	5.8	62546	5.5	59175
24	22.1	6.9	5.5	65246	6.1	73799
31	23.5	6.9	5.4	63671	5.6	65710
average	22.8	7.0	5.8	68182	6.5	77942
Aug. 7	23.0	6.9	5.9	84093	7.5	106499
14	23.6	6.6	4.4	47472	4.6	49775
21	22.6	6.7	4.5	46278	4.3	44260
28	20.8	6.6	5.1	52421	4.7	48536
average	22.5	6.7	5.0	57566	5.3	62268
Sept. 4	18.7	6.8	6.5	84986	6.8	89034
11	21.1	6.8	5.7	63685	4.4	49265
average	19.9	6.8	6.1	74340	5.6	69150
Season average	22.2	6.8	5.9	82490	5.6	75960
Sept. 18	19.9	6.8	5.9	86445	5.7	83617
25	17.9	6.6	6.4	76678	4.7	56555

11. Chisholm, Otis, (in). Livermore Falls, (out). The assumption is made that the samples taken at both stations are representative of the river conditions. For the fifteen week period the dissolved oxygen averages are:

Otis, (in)	78170 lbs/day	5.8 ppm	78950 lbs/day	5.6 ppm
L.F., (Out)	87220 lbs/day	6.6 ppm	90960 lbs/day	6.6 ppm
Increase	9048 lbs/day	0.8 ppm	12010 lbs/day	1.0 ppm

Tests indicates an average measured increase of B.O.D.5 (4790 lbs/day) between these stations. Aeration due to flow over the dams etc. appears to approximate twelve thousand pounds of oxygen per day.

The value of the aeration between the two stations, may be guaged from the following statistics.

Station	D.O. below FIVE ppm days	D.O. Low ppm
Chisholm (Otis)	28	3.1 August 18
Livermore Falls	1	3.8 August 18

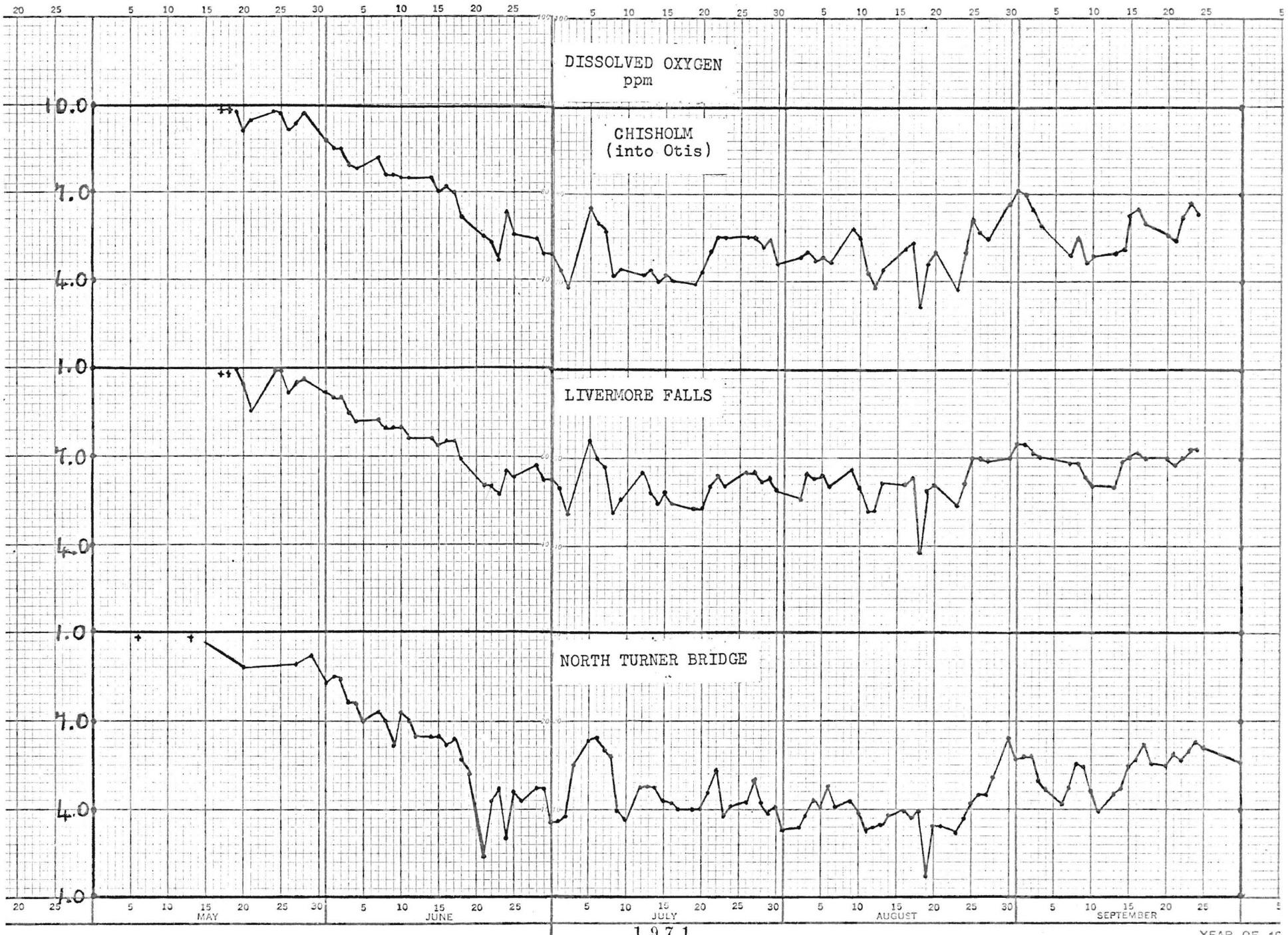
DISSOLVED OXYGEN - BIOCHEMICAL OXYGEN DEMAND

Weekly Average

1971

Chisholm (Otis)

Week Ending	Temp.	pH	Dissolved Oxygen ppm	Dissolved Oxygen lbs/day	B.O.D.5 ppm	B.O.D.5 lbs/day
June 5	16.1	6.7	8.2	180413	4.6	100214
12	19.4	6.6	7.7	166385	4.2	91495
19	20.0	6.7	6.9	107236	4.2	65971
26	23.6	6.7	5.5	78881	6.5	94237
average	19.8	6.7	7.1	133229	4.9	87979
July 3	23.5	6.7	4.7	61886	7.8	104306
10	23.6	7.0	5.4	60891	5.0	56280
17	23.1	6.6	4.2	44735	6.0	64292
24	22.6	6.6	4.8	57604	6.1	72586
31	23.9	6.6	5.2	62415	6.1	71968
average	23.4	6.7	4.9	57506	6.2	73886
Aug. 7	23.5	6.7	4.8	68111	6.5	92247
14	24.1	6.6	4.8	51825	5.1	55013
21	23.5	6.7	4.6	47536	4.9	50202
28	21.7	6.6	5.2	53515	4.9	50107
average	23.2	6.7	4.9	55247	5.3	61892
Sept. 4	19.3	6.7	6.6	87334	6.6	84542
11	21.7	6.7	4.9	55512	4.8	53392
average	20.5	6.7	5.7	71420	5.7	68970
Season average	22.0	6.7	5.6	78950	5.6	73790
Sept. 18	20.7	6.6	5.8	84992	5.5	79062
25	19.0	6.6	6.0	72018	4.4	52787


DISSOLVED OXYGEN
ppm
CHISHOLM
(into Otis)
LIVERMORE FALLS
NORTH TURNER BRIDGE
10.0
7.0
4.0
1.0
MAY
JUNE
JULY
AUGUST
SEPTEMBER
1971
YEAR OF 19

LIVERMORE FALLS

May, June, 1971

Date	Temp.	pH	D.O. ppm	D.O. % Sat.	D.O. lbs/d	B.O.D. ppm	B.O.D. lbs/d
May							
17	10.5	6.4	10.8	97.3		4.5	
18	11.5	6.5	10.6	98.3		4.4	
19	15.0	6.4	10.0	98.2		3.9	
20	15.9	6.8	9.5	95.0		5.2	
21	15.8	6.3	8.6	86.0		4.4	
24	14.8	6.6	9.9	97.2		3.9	
25	14.1	6.5	9.9	95.3		3.7	
26	14.0	6.7	9.2	88.4		3.5	
27	14.0	6.6	9.5	91.3		2.8	
28	14.0	6.8	9.6	92.3		3.8	
31	16.2	6.7	9.2	92.0		5.7	
June 1	17.6	6.8	9.0	94.7	217170	4.0	96520
2	17.2	6.7	9.0	92.8	198459	3.9	85999
3	17.3	6.7	8.5	87.6	177030	6.2	129127
4	17.8	6.7	8.2	86.3	169150	6.2	127894
Wk Av	17.5	6.7	8.7		190452	5.1	109885
7	17.8	6.6	8.3	87.3	154754	4.4	82038
8	19.0	6.6	8.0	85.2	170496	4.0	85248
9	22.0	6.6	8.0	90.8	202184	4.1	103619
10	20.1	6.7	8.0	86.9	186800	3.8	88730
11	18.8	6.8	7.6	80.8	150214	5.2	102778
Wk Av	19.5	6.6	8.0		172889	4.3	92483
14	19.5	6.8	7.6	82.7	123888	3.5	57054
15	20.0	6.9	7.4	80.4	120109	6.4	103878
16	20.8	6.6	7.5	83.4	117570	8.5	133246
17	21.0	6.7	7.5	83.3	112643	6.5	97624
18	21.5	6.8	6.9	78.4	98201	6.3	89662
Wk Av	20.6	6.7	7.4		114482	6.3	96293
21	24.5	6.7	6.0	71.4	84258	6.6	92684
22	25.7	6.7	6.0	73.2	87492	7.4	107901
23	24.8	6.8	5.7	67.9	85574	7.0	105091
24	24.8	6.4	6.5	77.4	94575	7.2	104760
25	23.8	6.7	6.3	74.2	86373	6.0	82260
Wk Av	24.9	6.7	6.1		87654	6.8	98539
28	22.9	6.6	6.7	76.2	85203	4.1	52517
29	23.9	6.6	6.2	72.9	71362	11.9	136969
30	23.5	6.7	6.2	73.0	76979	7.1	88154

Monthly Average June 1 to June 25

LIVERMORE FALLS

July 1, 1971

Date	Temp.	pH	D.O. ppm	D.O. % Sat.	D.O. lbs/d	B.O.D. ppm	B.O.D. lbs/d
1	25.5	6.7	6.0	73.3	71322	6.3	74888
2	25.1	6.7	5.1	60.8	93962	9.3	171343
Wk Av	24.1	6.7	6.0		79766	7.7	104774
5	22.6	7.3	7.6	87.3	92917	2.4	29342
6	23.8	6.9	7.0	82.4	78274	3.1	34664
7	24.1	6.7	6.7	78.8	71596	3.5	37401
8	24.4	7.1	5.1	60.1	55299	8.2	88913
9	24.8	7.2	5.6	66.7	62983	7.5	84353
Wk Av	23.9	7.1	6.4		72214	4.9	54935
12	24.6	6.7	6.5	77.4	65397	6.3	63384
13	24.8	6.6	5.8	69.0	60419	5.9	61460
14	23.8	6.7	5.4	63.6	58752	5.1	55488
15	24.0	6.6	5.8	68.3	64229	6.5	71981
16	23.8	6.8	5.4	63.6	60820	5.3	59694
Wk Av	24.2	6.7	5.8		61923	5.8	62401
19	24.2	6.5	5.3	62.3	61687	7.8	90784
20	24.0	6.7	5.3	62.3	64713	8.0	97680
21	23.4	6.6	6.0	70.7	78858	6.0	78858
22	23.8	6.4	6.4	75.3	76806	4.7	56405
23	23.8	6.7	6.0	70.6	63018	6.6	69320
Wk Av	23.8	6.6	5.8		69016	6.6	78609
26	25.3	6.5	6.5	77.3	86658	4.0	53328
27	25.3	6.5	6.5	77.3	78423	5.8	69977
28	25.1	6.5	6.2	73.8	72025	6.8	78996
29	24.8	6.6	6.3	75.2	70138	5.6	62345
30	25.4	6.7	5.9	70.3	65626	7.0	77861
Wk Av	25.2	6.6	6.3		74574	5.8	68501
Monthly Average July 1 - July 30							
	24.2	6.6	6.1		71499	6.1	73844

LIVERMORE FALLS

August, 1971

Date	Temp.	pH	D.O. ppm	D.O. % Sat.	D.O. lbs/d	B.O.D. ppm	B.O.D. lbs/d
2	25.1	6.7	5.7	67.8	70275	5.6	69042
3	26.0	6.6	6.5	79.3	92508	7.8	111010
4	25.0	6.9	6.3	75.2	93561	6.4	95046
5	23.8	6.7	6.4	75.3	102182	6.4	102182
6	22.9	6.7	6.0	68.8	80376	5.2	69659
Wk Av	24.6	6.7	6.2		87781	6.3	89388
9	23.9	6.6	6.6	77.7	73979	6.6	73979
10	25.5	6.7	6.0	73.3	64182	5.6	59903
11	25.2	6.5	5.2	61.8	56129	4.4	47494
12	25.5	6.6	5.2	63.4	56493	6.2	67357
13	24.5	6.7	6.0	70.7	64050	5.0	53375
Wk Av	24.9	6.6	5.8		62967	5.6	60422
16	23.5	6.7	6.0	70.7	59076	4.6	45292
17	24.5	6.6	6.3	74.8	61929	6.6	64878
18	24.0	7.0	3.8	44.7	38581	7.2	73102
19	25.0	6.5	5.9	70.3	64039	4.2	45587
20	24.6	6.5	6.0	70.3	64116	5.3	56636
Wk Av	24.3	6.7	5.6		57000	5.6	57099
23	24.8	6.5	5.4	64.3	53573	4.0	39680
24	22.5	6.7	6.1	70.2	63214	6.4	66323
25	21.2	6.6	7.0	77.7	74158	5.2	55089
26	22.0	6.7	7.0	79.6	69700	5.6	55770
27	22.0	6.9	6.9	78.5	71546	4.6	47697
Wk Av	22.5	6.7	6.5		66438	5.2	52912
30	21.0	6.8	7.0	77.8	123837	7.0	123837
31	21.0	6.6	7.5	83.3	100268	No Tests -	
Monthly Average August 2 - August 28							
	24.0	6.7	6.0		68547	5.7	64955

LIVERMORE FALLS

September, 1971

Date	Temp.	pH	D.O. ppm	D.O. % Sat.	D.O. lbs/d	B.O.D. ppm	B.O.D. lbs/d
1	20.8	6.5	7.5	83.3	88995	8.0	94928
2	20.7	6.8	7.1	78.8	79158	6.6	73583
3	20.8	6.7	7.0	77.7	80423	8.0	91912
Week average	20.9	6.7	7.2		94536	7.4	96065
6	Holiday						
7	23.0	6.8	6.8	78.3	76439	4.6	51709
8	21.8	6.7	6.8	77.3	81056	2.6	30992
9	24.0	6.7	6.3	74.2	70856	5.0	56235
10	23.0	6.7	6.1	70.1	62690	8.4	86327
Week average	23.0	6.7	6.5		72760	5.2	56316
Aug. 30-Sept.11 average	21.9	6.7	6.9		83650	6.3	76190
Season average	22.9	6.7	6.6		90960	5.9	78580
13	22.0	6.7	6.0	68.3	70806	6.6	27887
14	21.0	6.7	6.9	76.6	92060	6.8	90726
15	21.0	6.7	7.0	77.8	118181	5.6	94545
16	21.2	6.6	7.2	80.0	117871	7.6	124420
17	21.8	6.6	7.0	79.5	98154	5.6	78523
Week average	21.4	6.7	6.8		99414	6.4	77220
20	21.0	6.6	7.0	77.7	79814	4.0	45608
21	20.8	6.6	6.8	75.6	78309	6.0	69096
22	20.0	6.6	7.0	76.3	88305	4.9	61814
23	19.5	6.6	7.3	79.3	87564	4.3	51579
24	19.5	6.5	7.3	75.2	86454	6.1	72242
Week average	20.2	6.6	7.1		84090	5.1	60070

12. North Turner Bridge.

For the purposes of this report, North Turner Bridge marks the end of the upper river and the beginning of the Androscoggin Pool. The analytical data for North Turner and all stations south, are described in detail in Part Three of this report. For purposes of comparison with Livermore Falls certain statistics are presented here:

	Above FIVE ppm	Below FOUR ppm
1971	31 days	26 days
1970	47 "	24 "
1969	78 "	1 "
1968	47 "	20 "
1967	49 "	19 "
1966	19 "	51 "
1965	8 "	63 "

Dissolved Oxygen Summer Daily Averages

1971	4.90 ppm	1966	4.04 ppm
1970	5.20 "	1965	2.23 "
1969	6.50 "	1964	5.44 "
1968	5.89 "	1963	4.51 "
1967	5.17 "		

The lowest D.O. was recorded as 1.7 ppm on August 19 and is the only day reported below 3.0 ppm

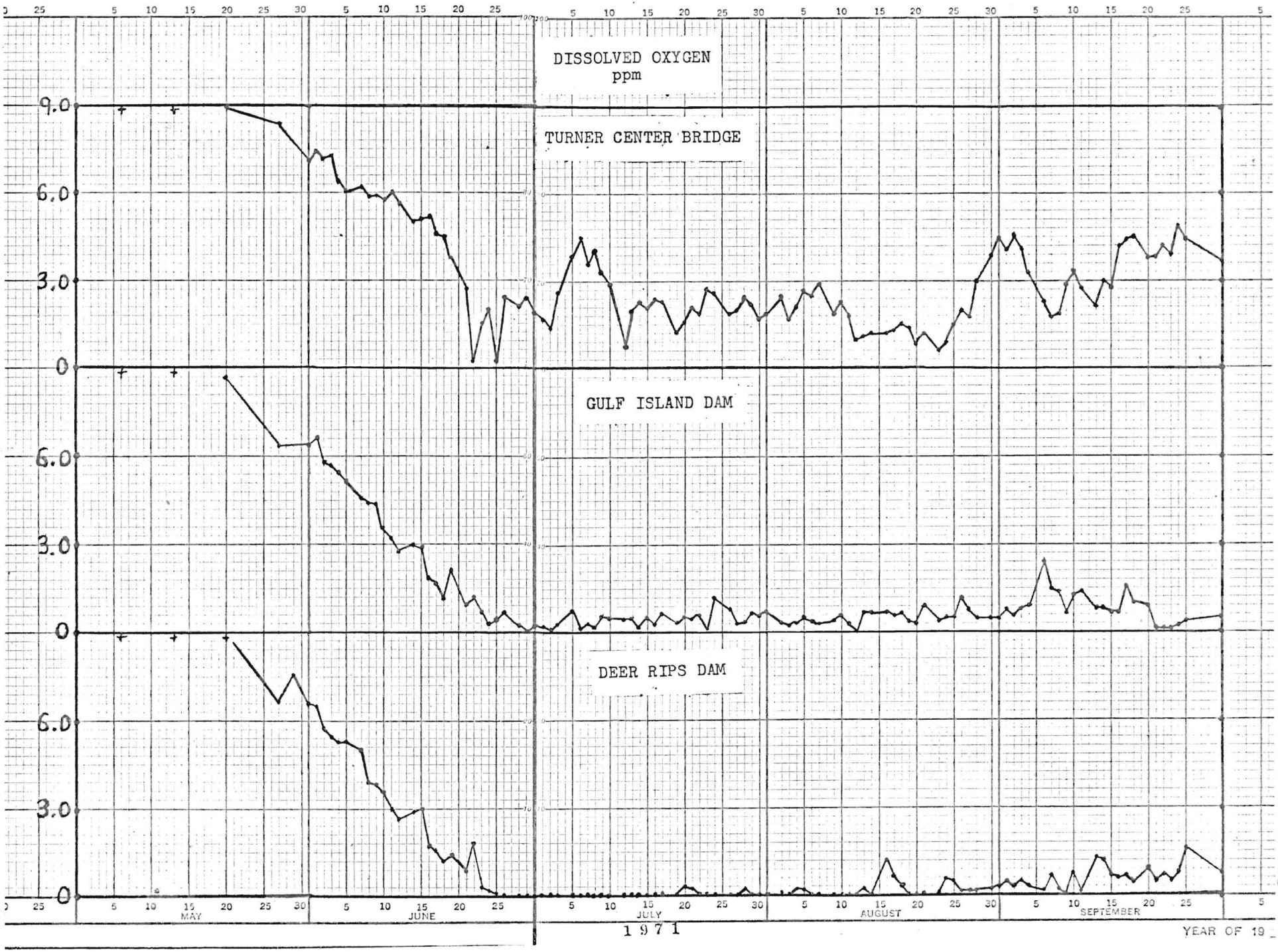
NORTH TURNER BRIDGE

Weekly average*

1971

Week Ending	Temp.	pH	Dissolved Oxygen ppm	Dissolved Oxygen lbs/day	B.O.D.5 ppm	B.O.D.5 lbs/day
June 5	16.6	6.7	8.0	186185	3.9	88823
12	19.1	6.6	7.0	156850	5.1	116693
19	20.1	6.7	6.3	100346	5.7	90108
26	23.3	6.7	3.7	54783	7.2	105423
average	19.8	6.7	6.3	124541	5.5	100262
July 3	22.8	6.7	4.0	53831	6.5	87068
10	23.1	6.9	5.7	65726	4.0	46279
17	22.7	6.8	4.5	48841	5.4	58300
24	22.3	6.8	4.3	52233	6.5	76854
31	23.6	6.8	4.3	51443	5.4	64798
average	22.9	6.8	4.6	54415	5.6	66660
Aug. 7	23.2	6.8	4.1	59663	5.7	84072
14	23.9	6.7	3.7	40013	4.8	52529
21	22.7	6.8	3.3	33463	4.5	45991
28	21.2	6.6	4.0	41131	4.5	45604
average	20.5	6.7	3.8	43568	4.9	57049
Sept. 4	18.9	6.8	5.7	78849	5.0	66122
11	21.4	6.8	4.9	54590	3.7	60458
average	20.2	6.8	5.3	66720	4.4	63290
Season average	21.7	6.8	4.9	71860	5.2	72610
Sept. 18	20.3	6.8	5.3	79070	5.3	78356
25	18.3	6.8	5.9	69033	4.9	57911

*Five day week

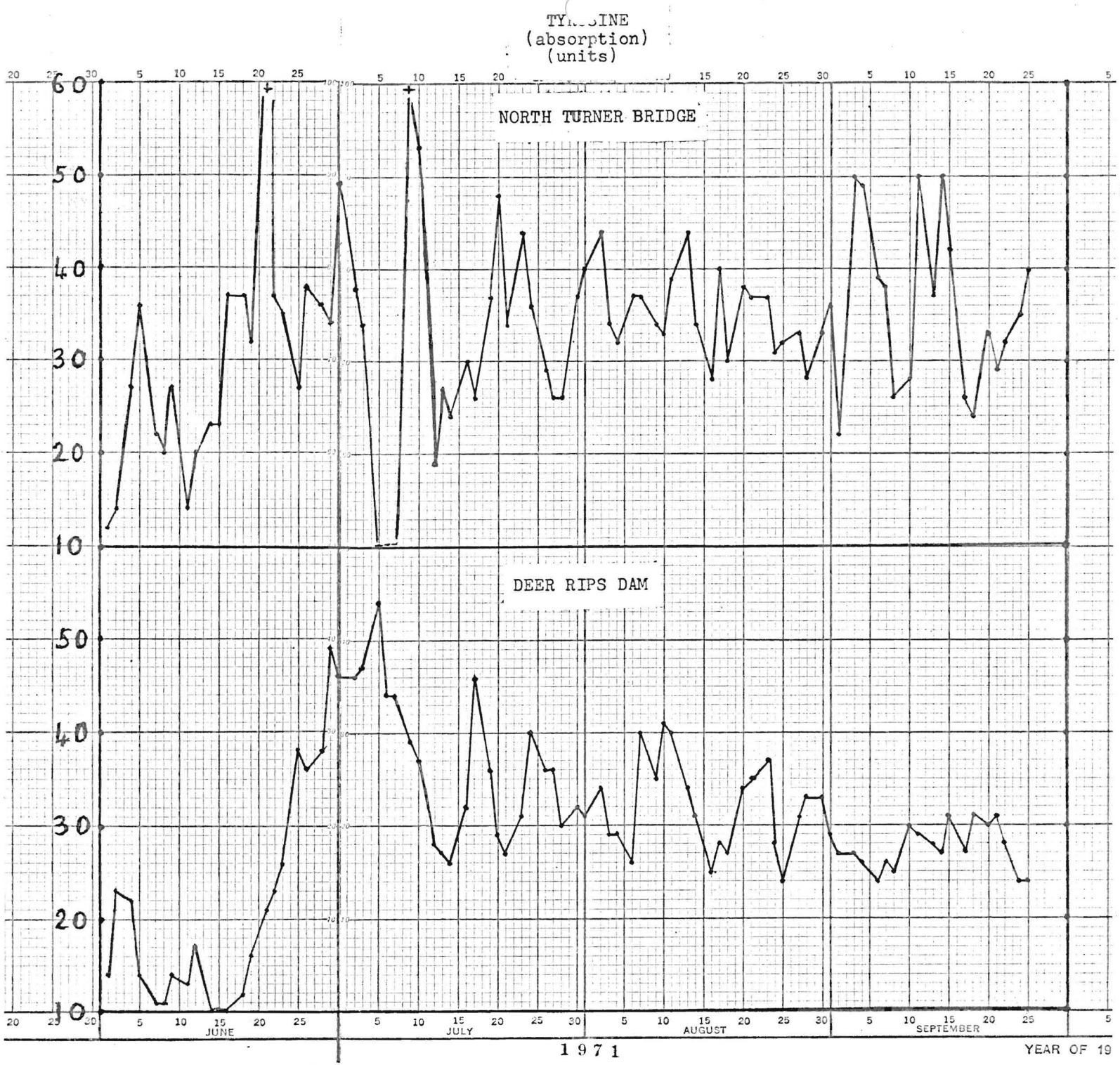

DISSOLVED OXYGEN
ppm
TURNER CENTER BRIDGE
GULF ISLAND DAM
DEER RIPS DAM
9.0
6.0
3.0
0
MAY
JUNE
JULY
AUGUST
SEPTEMBER
1971
YEAR OF 19

ANDROSCOGGIN RIVER
Dissolved Oxygen

SUMMER AVERAGES
lbs. per day

	Location	1971	1970	1969	1968
1.	Bell's	90590**	90000**	112740**	104900*
2.	Gorham	64600	67220	103340	95800
3.	Gilead	59610	63760	118200	92900
4.	Bethel	65980	68900	121360	-
5.	Rumford (VB)	63210	61160	134100	116400
6.	Dixfield (SP)	68230	-		
7.	Canton Point	64850	62500	101140	127900
8.	Riley Dam	62670	55880	148220	130800
9.	Jay	82490	78740	179340	169900
10.	Chisholm (Otis)	78950	78180	174660	148400
11.	Livermore Falls	90960	87220	190840	-
12.	North Turner Bridge	71860	70000	172240	141100
13.	Turner Center Bridge	48660	46880	154960	121000

*Thursdays only.
**Two tests per week


TYROSINE
(absorption)
(units)
NORTH TURNER BRIDGE
DEER RIPS DAM
60
50
40
30
20
10
JUNE
JULY
AUGUST
SEPTEMBER
1971
YEAR OF 19

TYROSINE LIGNIN.

The plot on an adjacent page illustrates the daily variations reported in the lignin tests on water sampled at North Turner and Deer Rips Dam. There is no consistent relation between this test and B.O.D. but a sudden increase in the lignin number indicates a "spill" or an unusual change in the pollution load. River water passing the mills during the preparation for the July fourth and labor day shut-downs, usually has a high lignin number when it arrives at North Turner. The seasons highest number was 74% absorption on June 21. This year the July fourth start-up produced very high lignin number (70%). During this season there were eleven tests at North Turner above the "alert" point, 40% absorption.

pH

pH AND AN ALKALI FISH KILL

Relatively large variations were recorded due to the discharge of lime muds, "spills", acids, etc. The daily tests are tabulated on the computor sheets filed at the back of this volume. The maximum and season averages for a few stations are listed below:

Station	Highest pH	June 1-Sept. 11 aver. pH
Gorham	7.2 (July 1)	6.6
Dixfield*	7.8 (Aug. 12)	6.8
Jay	7.5 (July 5)	6.8
North Turner	7.1 (Sept. 12)	6.8
Deer Rips	6.7 (June 4)	6.4

*For a brief period 10.8 was reported August sixteen.

On August twelve (about 8:30 a.m.) a representative of Oxford Paper Company telephoned the writer to report serious difficulty with the white liquor storage and line, which began about ten a.m. August eleven. He stated that, hopefully, the work on the mechanical problems would be complete about ten a.m. (August twelve). Unfortunately completion was not made until about five p.m., when the loss of alkali to the river, had totalled about seventy tons. This loss was spaced over about thirty-one hours and it does not appear to have directly produced any pH's above 7.8, or any visible fish-kill, when this water passed into the Androscoggin Pool; at North Turner the water registered a pH of 6.9.

Monday August sixteen, about 8:30 a.m. a representative of the Oxford Paper Company telephoned to report a massive loss of eighty (80) tons of white liquor, over a period of two (2) hours, one a.m. to three a.m., that morning due to a malfunction of a valve system. (Later, there was discovered a small black liquor loss which occurred late in the evening of the fifteenth.)

Frequent measurements indicated that the alkali spill had raised the pH to levels toxic to fish; one determination downstream was 10.8. The dissolved oxygen concentrations which had been averaging 3.8 ppm suddenly decreased to about 2.5 ppm.

On Tuesday (17th) dead fish, mostly suckers of all ages, were visible near the Oxford Paper Company's mill down to Canton Point Bridge. The fish were piling-up along the shore for many miles. After viewing the entire area a company representative estimated that about twenty thousand fish had died. Only a few

dead fish were observed at Riley and none downstream from that station. In a few days the dead fish were gone (many by the "Gull Route").

Comparisons of the two alkali "spills"

First	Second
1. About seventy tons to the river	1. About eighty tons to the river.
2. Duration about thirty-one hours.	2. About two hours.
3. No dead fish observed	3. "Twenty thousand" dead fish
4. Maximum known pH 7.8	4. About 10.8
5. Above normal pH to North Turner Bridge, not measurable there-after	5. Increased pH to North Turner Bridge. (pH 6.9 - D.O. 1.7 ppm August 19) at Turner Center Bridge pH 6.5 and D.O. 0.8 ppm August 20.